

**DRAFT**

**Total Maximum Daily Load for Total Phosphorus**

**for Lake Okeechobee Tributaries**

**S-133, S-135, S-154 and S-191 Basins**

**Okeechobee, Martin and St. Lucie Counties, Florida**

**US EPA Region 4  
61 Forsyth Street SW  
Atlanta, Georgia 30303**

**December 12, 2003**

## **ABBREVIATIONS**

BMP	Best Management Practice
CERP	Comprehensive Everglades Restoration Plan
CFR	Code of Federal Regulations
FAC	Florida Administrative Code
FDEP	Florida Department of Environmental Protection
DO	Dissolved Oxygen
HUC	Hydrologic Unit Code
L	Liter
LA	Load Allocation
LOPP	Lake Okeechobee Protection Plan
LOWP	Lake Okeechobee Watershed Project
MG	Milligram
MOS	Margin of Safety
NPDES	National Pollutant Discharge Elimination System
SFWMD	South Florida Water Management District
TMDL	Total Maximum Daily Load
TP	Total Phosphorus
UG	Microgram
WAM	Watershed Assessment Model
WBID	Water Body Identification
WLA	Waste Load Allocation

## SUMMARY SHEET TOTAL MAXIMUM DAILY LOAD

### 1. 303(d) Listed Waterbody Information

**State:** Florida

**Counties:** Okeechobee, Martin, St. Lucie

**Major River Basin:** Lake Okeechobee Basin (HUC 03090201)

**Lake Okeechobee watershed basins:** S-191, S-135, S-154, S-133

**Impaired waterbodies:**

Planning Unit Name	Assessment Unit Name	WBID	Lake Basin	Impaired Parameters
CTP Complex	Chandler Hammock Slough	3199B	S-154, S-191	Nutrients, DO
NHLMS Complex	Nubbin Slough	3203A	S-191, S-135	Nutrients, DO
	Mosquito Creek	3203B	S-191	Nutrients, DO
	Lettuce Creek	3213A	S-191, S-135	Nutrients, DO
	Henry Creek	3213B	S-191, S-135	Nutrients, DO
	S-135 Canal	3213C	S-135	Nutrients, DO
	Myrtle Slough	3213D	S-191	Nutrients, DO
TOL 63 Complex	Taylor Creek	3205	S-191, S-133	Nutrients, DO
	Otter Creek	3205D	S-191	Nutrients, DO

2. **TMDL endpoint:** TP concentration

### 3. Phosphorus Allocation:

WBIDs	WLA (mg/L)	Parameter	LA (mg/L)	MOS	TMDL (mg/L)
3199B, 3203A and B, 3213A-D, 3205, and 3205D	N/A	Total Phosphorus	0.159	Implicit	0.159

4. **Public Notice Date:**

5. **Submittal date:**

6. **Establishment date:**

7. **Endangered Species:** yes

8. **Lead on TMDL:** EPA

9. **TMDL considers point or non-point sources:** non-point

10. **Major NPDES dischargers into surface water:** none

## SECTION 1. INTRODUCTION

### 1.1 Purpose of Report

Section 303(d) of the Clean Water Act requires each state to list those waters within its boundaries for which technology-based effluent limitations are not stringent enough to protect any water quality standard applicable to such waters. Listed waters are prioritized with respect to designated use classifications and the severity of pollution. In accordance with this prioritization, states are required to develop Total Maximum Daily Loads (TMDLs) for those water bodies that are not meeting water quality standards. The TMDL process establishes the allowable loadings of pollutants or other quantifiable parameters for a waterbody based on the relationship between pollution sources and in-stream water quality conditions, so that states can establish water quality based controls to reduce pollution from both point and non-point sources and restore and maintain the quality of their water resources (USEPA, 1991).

The Florida Department of Environmental Protection (FDEP) has developed a statewide, watershed-based approach to water resource management. Under the watershed management approach, water resources are managed on the basis of natural boundaries, such as river basins, rather than political boundaries. The watershed management approach is the framework FDEP uses for implementing TMDLs. The state's 52 basins are divided into five groups. Water quality is assessed in each group on a rotating five-year cycle. The Lake Okeechobee Basin is a Group 1 Basin, first assessed in 2000 with plans to revisit water management issues in 2005. There are five water management districts in Florida responsible for managing groundwater and surface water. The Lake Okeechobee Basin is in the South Florida Water Management District (SFWMD).

For the purpose of planning and management, basins are divided into planning units. A planning unit is either an individual primary tributary basin or a group of adjacent primary tributary basins with similar characteristics. These planning units contain smaller, hydrological units called drainage basins, which are further divided into water segments. A water segment usually contains only one unique waterbody type (stream, lake, canal, etc.) and is about five square miles. Unique numbers or **waterbody identification** (WBIDs) numbers are assigned to each water segment.

This report presents the Total Maximum Daily Loads developed to address Total Phosphorus (TP) for certain impaired waterbodies within the Lake Okeechobee Basin (not including the lake itself for which a TP TMDL has already been developed). These waterbodies include the S-135 and S-191 basins, and part of the S-133 and S-154 basins. The waterbodies being addressed under this TMDL were verified as impaired by nutrients. This report also describes the projected impact of proposed TP reductions on dissolved oxygen (DO) levels and turbidity in some of the waterbodies. See Table 1 and Figures 1-3 for the water bodies included in this TMDL document.

The TMDLs addressed in this document are being established pursuant to USEPA commitments in the Consent Decree in the Florida TMDL lawsuit (Florida Wildlife Federation, et al. v. Carol Browner, et al., Civil Action No. 4: 98CV356-WS, 1998). TMDLs are to be developed for all of the impairments on the approved 1998 303(d) list. The State of Florida proposed a TMDL addressing these impairments on June 30, 2003. Because an administrative hearing has been requested regarding Florida's proposed TMDLs, the State was not able to finalize its proposed TMDL by the date required by the Consent Decree. Therefore, USEPA is proposing this TMDL in order to comply with the Consent Decree. Much of the work which

provides the technical basis for the TMDL was performed by the FDEP and has been utilized by USEPA in this proposal.

Planning Unit Name	Assessment Unit Name	WBID	Lake Basin	Impaired Parameters
CTP Complex	Chandler Hammock Slough	3199B	S-154, S-191	Nutrients, DO
NHLMS Complex	Nubbin Slough	3203A	S-191, S-135	Nutrients, DO
	Mosquito Creek	3203B	S-191	Nutrients, DO
	Lettuce Creek	3213A	S-191, S-135	Nutrients, DO
	Henry Creek	3213B	S-191, S-135	Nutrients, DO
	S-135 Canal	3213C	S-135	Nutrients, DO
	Myrtle Slough	3213D	S-191	Nutrients, DO
TOL 63 Complex	Taylor Creek	3205	S-191, S-133	Nutrients, DO
	Otter Creek	3205D	S-191	Nutrients, DO

**Table 1. Basin Planning and Assessment Units, Corresponding WBIDs, and Impairments on the 1998 303(d) list that are being addressed by the TMDLs in this report.**

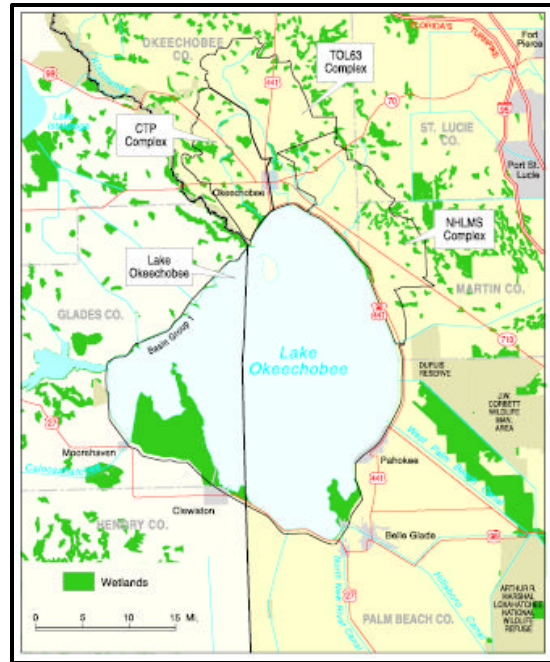
## 1.2 Identification of Waterbodies

The Lake Okeechobee Basin is divided into three planning units: the CTP Complex, the TOL63 Complex and the NHLMS Complex (Table 1 and Figures 1- 3). The region's surface hydrology is largely controlled by man-made systems. A system of encircling levees impounds Lake Okeechobee, and pumping stations and control structures in the levees are designed to move water either into or out of the lake as needed, permitting water levels to fluctuate greatly with flood and drought conditions or the demand for water.

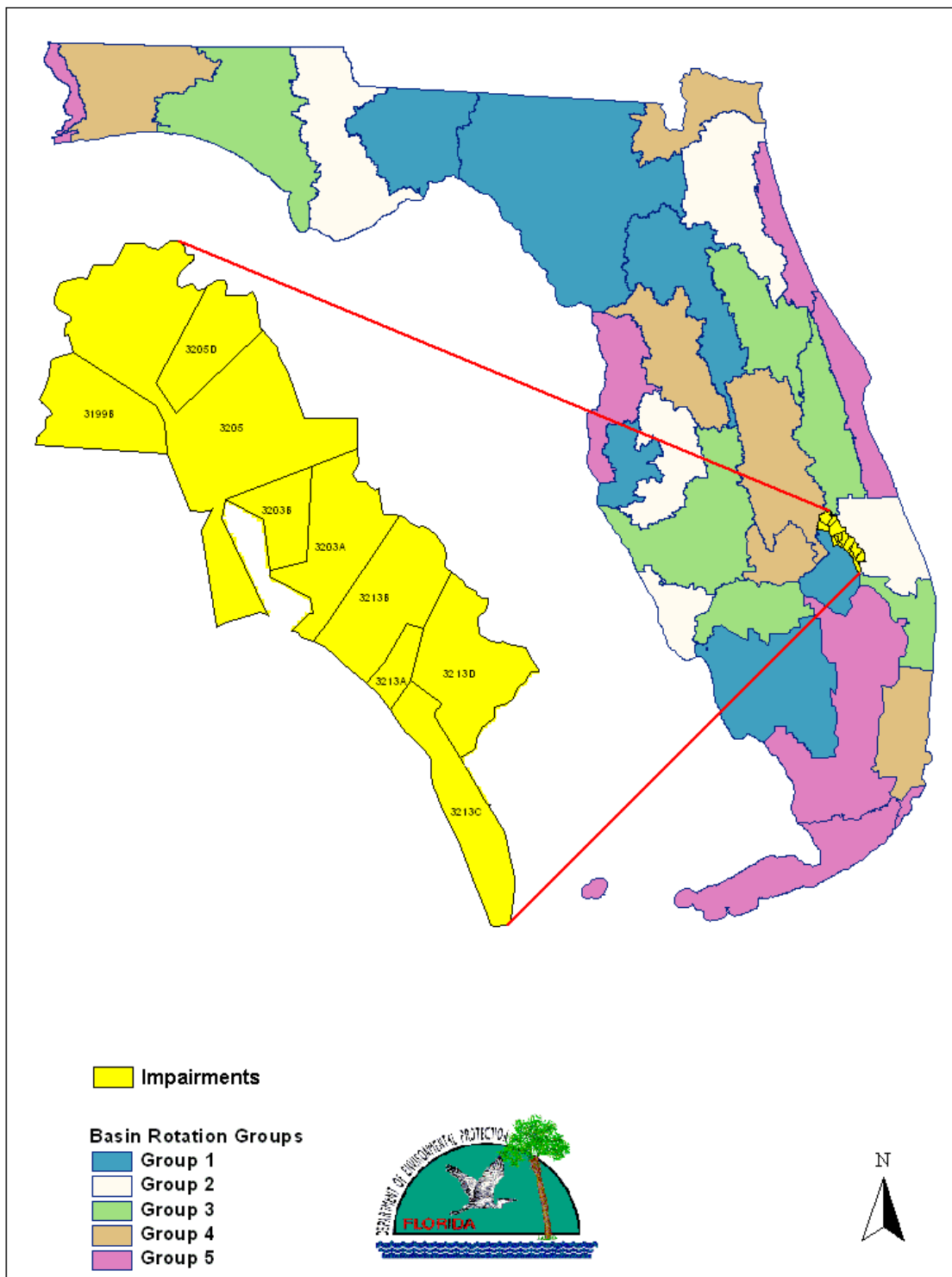
The following description of the Lake Okeechobee Basin and its assessment units is taken from the Lake Okeechobee Basin Status Report (FDEP 2001a).

### NHLMS Complex

The NHLMS Complex includes Nubbin Slough, Henry Creek, Lettuce Creek, Mosquito Creek, Myrtle Slough, and waters within the drainages leading to the South Florida Water Management District's structures S-135 and S-153. The NHLMS Complex covers about 131 square miles and contains about 29 miles of streams. It consists of a collection of small tributary streams along the northeast shore of Lake Okeechobee that once flowed directly into the lake but are now intercepted by canals prior to reaching the Hoover DiLevee. Mosquito Creek (WBID 3203B) is four miles long and flows from northeast to southwest where it is intercepted by the L-63 canal, which transports water to the rim canal (C-59), and the S-191 structure which discharges to the lake. Land uses include dairies, pasture, and citrus production. Henry Creek (WBID 3213B) is four miles long and flows from northeast to southwest where it meets the rim canal (C-59) and flows into the lake via Gate 36 (Henry Creek Lock) and the S-135 structure six miles to the southeast. Land uses include dairies, pasture, and low-density residential housing. Nubbin Slough (WBID 3203A) is about 7 miles long and flows to the southwest where it meets the L-63 Canal. Significant land uses include dairies, pasture, citrus and low density residential areas. Myrtle Slough (WBID 3213D) is about 4 miles long and flows to the southwest where it crosses the S-135 Basin and drains to the lake at S-135.



**Figures 1 and 2. Lake Okeechobee Basin drainage basins (left, SFWMD 2003) and planning unit locations and boundaries (right, FDEP 2001).**



**Figure 3. Impaired WBIDs located in the Lake Okeechobee Basin Utilized for TMDL Development**

### CTP Complex

The CTP Complex includes the S-154 basin and part of the S-133 basin. It covers about 86 square miles and contains about 11 miles of streams. Chandler Hammock Slough (WBID 3199B) flows southward into Turkey Slough (WBID 3199A), which flows into Popash Slough (WBID 3205C). Flow from these connected sloughs is intercepted by the rim canal around Lake Okeechobee. Depending on lake stage, water can flow from the rim canal into the lake through hurricane gate structure 6. Water can also be pumped through S-133 into the lake. The dominant land use is agriculture, about 90% of which is pasture for livestock grazing, 6% of which is dairies and 3% of which is row and field crops.

### TOL63 Complex

The TOL63 Complex covers 108 square miles and contains 45 miles of streams and canals. It includes part of the S-191 basin and the eastern portion of the S-133 basin. There are three assessment units within the complex: Taylor Creek (WBID 3205), Otter Creek (WBID 3205D) and the L-63 Canal (WBID 3203C). Otter Creek flows about 3.5 miles southwesterly before joining Taylor Creek. Taylor Creek is 29 miles long. Taylor Creek flows eventually reach the Lake Okeechobee rim canal. S-191 is the primary flow-through point draining to the Lake. Major land uses are agriculture, forest and urban lands.

Land Use	S-133		S-135		S-154		S-191	
Urban	7,314	30.1%	836	4.7%	2,531	8.2%	6, 156	5.1%
Agriculture	11,911	49.0%	13,017	72.6%	20,223	65.7%	83,788	69.6%
Rangeland	396	1.6%	147	0.8%	1,724	5.6%	2,372	2.0%
Upland Forests	2,052	8.4%	1,103	6.1%	1,451	4.7%	15,108	12.6%
Water	1,061	4.4%	607	3.4%	167	0.6%	1,388	1.1%
Wetlands	1,500	6.2%	862	4.8%	4,354	14.2%	11,387	9.5%
Barren Land	80	0.3%	672	3.7%	7	0.0%	4	0.0%
Transportation, utilities	0	0%	701	3.9%	305	1.0%	120	0.1%
TOTAL	24,314	100%	17,945	100%	30,762	100%	120,323	100%

**Table 2. Land Use in Lake Okeechobee Basins (acres and percent of basin area) (SFWMD, 2003).**

## **SECTION 2. STATEMENT OF PROBLEM**

Based on the Florida Department of Environmental Protection's (FDEP's) Lake Okeechobee Basin Status Report (FDEP 2001a), the most common water quality problems in the Lake Okeechobee Basin are elevated levels of nutrients and low dissolved oxygen. Water quality data from 1989 to 1998 for the CTP Complex indicate low dissolved oxygen and elevated total nitrogen and total phosphorus, relative to criteria or statewide medians. TP levels are much



higher than statewide medians, and most of the DO observations fell below the 5.0 mg/L water quality criterion. Water quality data from 1989 to 1998 for the TOL63 Complex indicate low dissolved oxygen and elevated total phosphorus. Most of the DO observations fell below the 5.0 mg/L criterion. Water quality data from 1989 to 1998 for the NHLMS Complex indicate low dissolved oxygen and elevated total phosphorus, relative to criteria or statewide medians. Most of the DO observations fell below the 5.0 mg/L criterion.

### **SECTION 3. WATER QUALITY STANDARDS AND NUMERIC WATER QUALITY TARGETS**

#### Nutrients

The waterbodies addressed by this TMDL are classified as Class III freshwater bodies, with a designated use of recreation, propagation and maintenance of a healthy, well-balanced population of fish and wildlife. The Class III water quality criterion for nutrients that is applicable is a narrative criterion (nutrient concentrations of a body of water shall not be altered so as to cause an imbalance in natural populations of aquatic flora or fauna). Because the nutrient criterion is narrative only, a nutrient related target is needed to represent levels above which an imbalance in flora or fauna are expected to occur.

The quantification of nutrient levels that lead to imbalance can be difficult. FDEP evaluated methods to determine the nutrient levels at which imbalance occurs, including using water quality models and statistical analysis of the relationships between nutrient concentrations and DO (using Artificial Neural Networks). However, these methods were not successful. The water quality model did not adequately calibrate for all of the relevant parameters because of inadequate water quality and flow data. Additionally, the relationships between TP and DO were not statistically significant.

For this TMDL, a target TP concentration was calculated using a reference stream approach. This approach, which is one of USEPA's recommended approaches for the development of nutrient criteria (USEPA 2000), uses an appropriate percentile of measured values from reference waters to determine the numeric water quality target or criterion. No nutrient TMDL is proposed for nitrogen since TP is the limiting nutrient in these waterbodies (SFWMD, 2003).

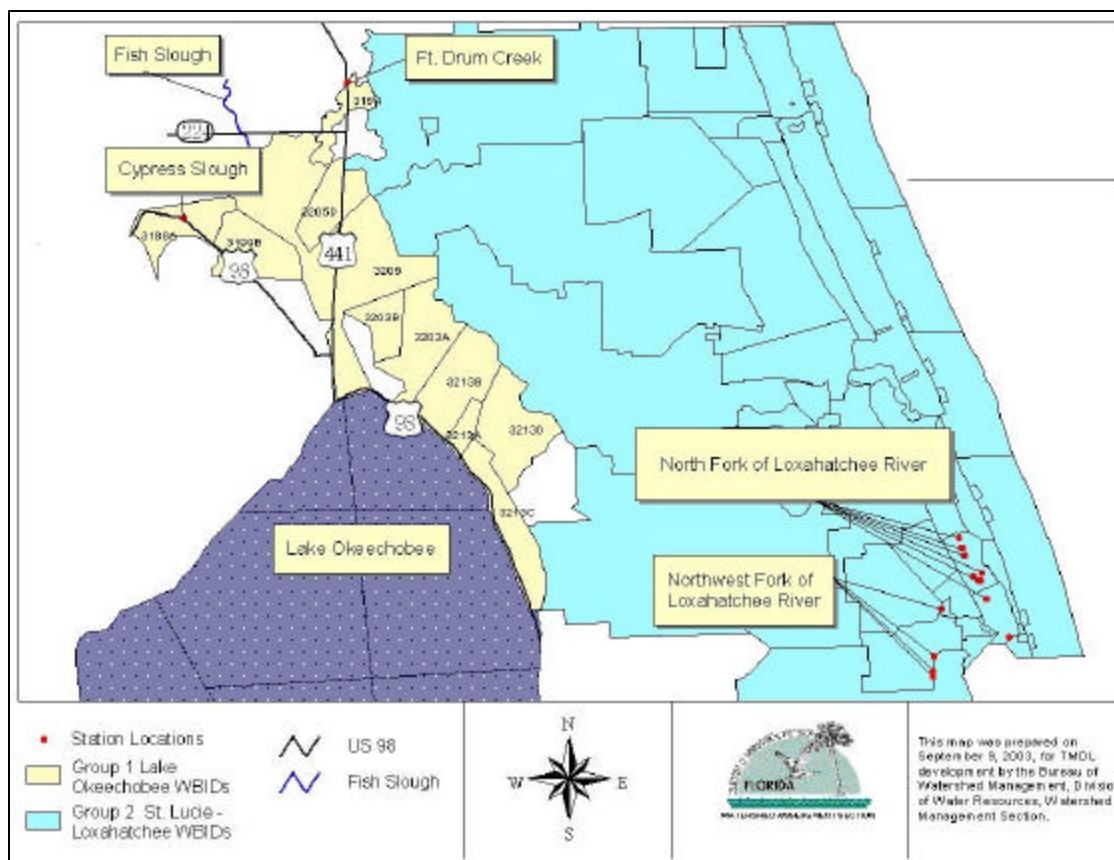
USEPA recommends that the reference streams should be minimally disturbed and should be the least impacted streams for that stream class within a region. If the reference waters are known to be of high quality, USEPA recommends using the 75<sup>th</sup> percentile of the measured value of the nutrient of concern to establish the water quality target for that nutrient.

Data from five reference streams in the region were used to derive the target TP concentration for the tributaries in the Lake Okeechobee Basin. The five reference streams selected were: Ft. Drum Creek, Cypress Slough, Northwest Fork of Loxahatchee River, North Fork of Loxahatchee River, and Fish Slough (Figure 4). Data used from these streams are provided in Appendix A, which includes a spreadsheet showing the percentile rankings of the data.

The entire data record was not used for each station. For Fish Slough, which is within the Lake Okeechobee watershed and which has similar soil and topography, there were phosphorus data available dating back to 1986. However, land use changes and increased agricultural activity in the watershed since 1996 have led to the concern that Fish Slough may no longer be suitable as a reference site. For this reason, Fish Slough data for only 1986-1995 were used to determine the TP target. There were 490 TP samples for these five streams and the 75<sup>th</sup> percentile value for TP is **0.159 mg/L**.

Biological assessments are useful tools for measuring the health of waterbodies and for protecting aquatic life. Biological assessments evaluate the condition of a water body using direct measurements of aquatic life and are an indicator of ecological integrity. The presence, condition and numbers of types of organisms are data that provide direct information about the health of specific bodies of water. Studying these factors as a way of evaluating the health of a body of water is called biological assessment. Aquatic macroinvertebrates are commonly used in biological assessments as indicators of aquatic health (USEPA 1999, USEPA 2002).

Florida has developed a Stream Condition Index (SCI) which uses macroinvertebrates as an indicator of ecosystem health and to identify impairment with respect to the reference (or natural) condition (FDEP 1996). SCI data from 1992 to 2002 were obtained from FDEP for four of the reference streams (Appendix B). The median SCI for each is as follows: Ft. Drum Creek 29 (excellent); Cypress Slough 33 (excellent); Northwest Fork of Loxahatchee River 27 (excellent) and North Fork of Loxahatchee River 29 (excellent). These SCI data provide direct evidence that the macroinvertebrate communities in these reference streams are in excellent health.



**Figure 4. Reference Streams Used to Determine Target TP Concentration**

### Dissolved Oxygen

As noted in Table 1, all of the 9 WBIDs addressed by this TMDL have also been verified as not meeting Florida's Class III 5.0 mg/L water quality criterion for dissolved oxygen (DO). DO levels in these waterbodies can naturally fluctuate below the Class III criterion, particularly during the early morning hours. FDEP plans to conduct additional monitoring within the watershed to determine natural background DO levels for these waters, and the appropriateness of the 5.0 mg/L water quality criterion.

This TMDL specifically addresses the nutrient impairment of these waters and does not constitute a TMDL for DO impairment. However, dissolved oxygen and nutrients are often inter-related. Many specific efforts are underway or planned in the Lake Okeechobee Basin to control phosphorus (Lake Okeechobee Protection Plan, SFWMD, FDEP and FDACS 2003). These efforts are expected to control animal waste, nitrogen, turbidity, and transport of suspended solids – all of which can exert an oxygen demand in a waterbody. Therefore, efforts to control phosphorus can be expected to also result in improvements in DO and turbidity.

## **SECTION 4. SOURCE ASSESSMENT**

An important part of the TMDL analysis is the identification of source categories and individual sources of nutrients in the watershed and the amount of pollutant loading contributed by each of these sources. Sources are broadly classified as either point sources or nonpoint sources.

### **4.1 Point Sources**

A point source is defined as a discernable, confined, and discrete conveyance from which pollutants are or may be discharged to surface waters. Point source discharges of industrial wastewater and treated sanitary wastewater must be authorized by National Pollutant Discharge Elimination System (NPDES) permits. NPDES permitted facilities discharging treated sanitary wastewater or stormwater are typically considered primary sources of nutrients.

In October 2000, USEPA authorized FDEP to implement the NPDES stormwater program in all areas of Florida except Indian Country lands. FDEP's authority to administer the NPDES program is set forth in Section 403.0885, Florida Statutes (F.S.). The NPDES stormwater program regulated point source discharges of stormwater into surface waters of the State of Florida from certain municipal, industrial, and construction activities. The NPDES stormwater permitting program is separate from the State's stormwater/environmental resource permitting program, and local stormwater/water quality programs, which have their own regulations and permitting requirements.

There are currently no point sources with NPDES permits in the S-191, S-133, S-135 and S-154 basins.

### **4.2 Nonpoint Sources**

Nonpoint sources of nutrients are diffuse sources that cannot be identified as entering a waterbody through a discrete conveyance at a single location. These sources generally, but not always, involve accumulation of nutrients on land surfaces and wash off as a result of storm events. Non-point sources of phosphorus loading in the Lake Okeechobee Basin include: atmospheric deposition, stormwater runoff, wildlife, agricultural activities and septic systems. As described in the June 30, 2003 draft of this document, FDEP used a Watershed Assessment

Model (WAM) to estimate nonpoint source loads to the waterbodies in the S-191 basin. Information about the modeling is available in FDEP's files and will be provided upon request. A key resource for the source assessment is the Lake Okeechobee Assessment Report (FDEP, 2003), which includes a detailed source assessment and historical review in Chapter 3.

## SECTION 5. DETERMINATION OF TMDL

A TMDL can be expressed as the sum of all point source loads (Waste Load Allocations, WLA), nonpoint source loads (Load Allocations, LA), and an appropriate margin of safety (MOS), which takes into account any uncertainty concerning the relationship between effluent limitations and water quality:

$$\text{TMDL} = \Sigma \text{WLAs} + \Sigma \text{LAs} + \text{MOS}$$

The objective of a TMDL is to allocate loads among all of the known pollutant sources throughout a watershed so that appropriate control measures can be implemented and water quality standards achieved. TMDLs can be expressed in terms of mass per time (e.g. pounds per day), toxicity, or other appropriate measure [see 40 CFR §130.2 (i)]. The TMDL for the waterbodies in the Lake Okeechobee Basin is expressed in terms of a median TP concentration of 0.159 mg/L, which is the estimated concentration associated with a balanced flora and fauna at this time (Table 3).

**Table 3. TMDL Components**

WBIDs	WLA (mg/L)	Parameter	LA (mg/L)	MOS	TMDL (mg/L)
3199B, 3203A and B, 3213A-D, 3205, and 3205D	N/A	Total Phosphorus	0.159	Implicit	0.159

### 5.1 Wasteload Allocation (WLA)

The TMDL for these 9 WBIDs in the Lake Okeechobee Basin does not include any wasteload allocations because there are no point sources with NPDES permits.

### 5.2 Load Allocation (LA)

As there is no WLA for this TMDL, the LA is the same as the TMDL and is expressed as a median TP concentration of 0.159 mg/L. This concentration, calculated from the reference stream approach, is associated with balanced flora and fauna as indicated by macroinvertebrate data. However, as noted previously in the water quality target section, nutrient imbalance can be difficult to quantify in these hydrologically altered systems and there is uncertainty associated with this target. In acknowledgement of the uncertainty associated with this TMDL, FDEP has proposed an adaptive management approach to restoring the waterbodies within the Lake Okeechobee Basin. The initial TP reduction called for by this TMDL is 30%. Once this reduction in loading is achieved, the water quality of the system will be reassessed and the TMDL re-evaluated based on the conditions at that time.

### 5.3 Relationship Between this TMDL and the TMDL for Lake Okeechobee

This TMDL is specifically designed to protect the designated uses of the tributary waterbodies within the Lake Okeechobee Basin. However, the load from these waterbodies, as tributaries to Lake Okeechobee, must also be consistent with the TP TMDL for Lake Okeechobee in order to be adequately protective of the designated uses of the Lake.

The Lake Okeechobee TP TMDL of 140 metric tons was adopted by Florida in May 2001. The TMDL is allocated to atmospheric deposition (35 metric tons) and to the sum of all nonpoint surface water inputs to the lake (105 metric tons) on an annual average basis. It is calculated using a 5-year rolling average of the monthly loads computed from flow and concentrations values at all inflows to the lake. The Lake Okeechobee Surface Water Improvement and Management Plan identifies 34 basins that discharge into Lake Okeechobee (SFWMD 2003).

To determine whether the concentration-based TMDL for these 9 WBIDs is less than the lake TMDL, the load from the tributaries is calculated using a concentration of 0.159 mg/L and the average annual discharge for 1995-2000 (SFWMD 2003). An example calculation is shown below.<sup>1</sup> These 9 WBIDs are in the S-191, S-133, S-135 and S-154 basins (Table 1 and Figures 1-3).

Basin	1995-2000 discharge (acre-feet) (SFWMD 2003)	1995-2000 TP Load at 0.159 mg/L (metric tons)
S-191	97,154	19.05
S-133	23,924	4.69
S-135	22,845	4.48
S-154	26,602	5.22
TOTAL		33.44

The 33.44 metric tons of TP for these four lake basins are below the 105 metric tons total allowed for the lake basins. However, there are 30 other tributaries to the lake and combined allocations established for all 34 tributaries into the lake must not exceed the 105 metric tons limit established in the lake TMDL. As such, the phosphorus loading from this study area must be considered when nutrient TMDLs are established for the Kissimmee River and Fisheating Creek, other major Lake Okeechobee tributaries, in 2005/2006. At that time, allocations will be established that meet the allowable 105 metric tons of TP across all lake tributaries.

#### 5.4. Margin of Safety

A margin of safety (MOS) is required as part of a TMDL in recognition that there are uncertainties in the scientific and technical understanding of the chemical and biological processes needed to determine the assimilative capacity of a waterbody. The MOS is intended to account for such uncertainties in a conservative manner that protects the environment.

<sup>1</sup> The TP Load for the S-191 basin was calculated as follows:

$$\begin{aligned}
 \text{TMDL (S-191)} &= \text{TP target concentration} \times \text{average annual discharge} \\
 &= (0.159 \text{ mg/L}) \times (97,154 \text{ acre-feet}) \\
 &\quad \times (43,560 \text{ feet}^3/\text{acre-foot}) \times (1 \text{ m}^3/35.314 \text{ feet}^3) \\
 &\quad \times (1000 \text{ L/m}^3) \times (1 \times 10^{-6} \text{ kg/mg}) \\
 &\quad \times (1 \text{ metric ton}/1000 \text{ kg}) \\
 &= \mathbf{19.05 \text{ metric tons.}}
 \end{aligned}$$

According to USEPA's guidance, a MOS can be achieved explicitly through reserving a portion of the load for the future, or implicitly by using conservative assumptions in calculating the load.

In this case, the MOS is implicit by using the 75<sup>th</sup> percentile of reference streams as the target TP concentration. This approach includes a MOS because it does not take into account the capacity of the reference waters to assimilate additional TP without leading to an imbalance in their flora or fauna.

Since the TP data for the reference streams include several years and seasons, the proposed TMDL takes into consideration annual variation and seasonal variation.

## **SECTION 6. IMPLEMENTATION PROPOSED BY FDEP**

After this TMDL is established, the next step in the TMDL process is to develop an implementation plan for the TMDL. FDEP implements TMDLs as a component of the Basin Management Action Plans, in this case the Management Plan for the Lake Okeechobee Basin. This document will be developed in cooperation with local stakeholders and will attempt to reach consensus on more detailed allocations and on how load reductions will be accomplished.

As noted previously, FDEP proposes to implement this TMDL using an adaptive management approach that acknowledges the uncertainty associated with the TP target. As part of the Basin Management Action Plan for this TMDL, FDEP plans to require an initial reduction in nonpoint source TP loads of 30% and then monitor the water quality response before additional reductions are required. While this reduction will not result in full attainment of the concentration target, it will provide substantive, incremental progress towards the restoration of the system and of Lake Okeechobee. Initially using a 30% reduction is reasonable as FDEP is involved in several initiatives listed below that will be useful in determining future restoration targets for the S-191 basin. Regional treatment projects are being planned for the S-191 basin under the Comprehensive Everglades Restoration Plan (CERP) – Lake Okeechobee Watershed Project (LOWP) that will further reduce the phosphorus loading to Lake Okeechobee.

1. FDEP is currently working to develop new numeric nutrient criteria for state surface waters, which will include developing nutrient criteria for waterbodies like the Lake Okeechobee Basin tributaries.
2. Once FDEP develops new numeric nutrient criteria for these waters, the TMDL will need to be amended to use those criteria as the water quality target for the TMDL.
3. These waters will be reassessed by FDEP through the state's basin management cycle every five years. During the reassessment, FDEP will consider if the TP load reduction targeted in the TMDL has been achieved.
4. The proposed reduction is consistent with FDEP's recommended allocation process, as described in the Allocation Technical Advisory Committee 2001 report titled Report to the Governor and Legislature on the Allocation of Total Maximum Daily Loads in Florida (FDEP, 2001). The report recommends that nonpoint sources that are outside of FDEP's regulatory authority should only be held responsible for reductions associated with the implementation of Best Management Practices (BMPs) applicable to the activity. If additional reductions are required, the report recommends that public funds be used to provide the additional load reductions because BMPs take economic constraints into

account and further reductions by individual landowners are likely not practical. This process is already being evaluated for the S-191 basin through the development of the Lake Okeechobee Protection Plan (LOPP).

For the development of the LOPP, three levels of BMPs are considered: 1) BMPs that the landowners can afford without financial assistance, 2) typical BMPs that require some cost-share, and 3) additional BMPs such as chemical treatment that require extensive cost-share and are not cost-effective when compared to regional treatment projects. For the case of this TMDL, the implementation of landowner and typical cost-share BMPs for addressing nonpoint sources in the S-191 watershed are expected to achieve an approximate 25 % reduction in TP loading. FDEP plans to continue to work with the Florida Department of Agriculture and Consumer Services and local landowners to ensure that appropriate agricultural BMPs are implemented in a timely manner so that this reduction target is realized. Additionally, public funds provided for implementation of the Lake Okeechobee Protection Act are being utilized to fund innovative projects at parcel and regional levels to reduce phosphorus loads. It is estimated that an additional 40% P load reduction will be observed in the S-191 basin from the implementation of these projects. Public funds administered through the CERP-LOWP and LOPP are expected to address the remaining required reductions in P loading, but it will take several years before these funds are fully authorized and appropriate regional stormwater treatment areas can be designed and constructed.

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## **APPENDIX A**

### **Total Phosphorus data for Reference Streams**

(download file from USEPA web site)

## **APPENDIX B**

### **SCI macroinvertebrate data for Reference Streams**

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